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**ASSESSMENT OF NON-NUTRITIONAL POSSIBILITIES
OF HUMAN MILK USING**

SUMMARY

Introduction: Scientific societies unanimously recognize breastfeeding as the gold standard of nutrition for newborns and infants up to 6 months of age. The discovery of growth factors, cytokines, and a heterogeneous population of cells - including stem cells, probiotic bacteria and the HAMLET complex in human milk, led to increased interest in effectiveness of non-nutritional applications of breast milk. In recent years, human milk has been the subject of many scientific studies, both in preclinical and clinical trials. There have been many reports of the topical use of human milk as an effective form of treatment for diaper dermatitis, atopic eczema, eye wounds healing and the umbilical cord stump care. This protective role of human milk is especially important in developing countries, where mothers and infants do not have easy access to professional medical care. In these situations, milk therapy is often a decisive factor in infant recovery and survival. However, even in developed countries, there are increased interest in human milk and its non-nutritional usage.

Aim: The aim of this study was to analyze the subject of non-nutritional possibilities of using breast milk, including: assessment of attitudes of pregnant women towards the possibility of using breast milk in the umbilical cord stump care, assessment of the safety and effectiveness of breast milk usage in the care of the umbilical cord stump and the impact of this procedure on the umbilical cord separation time compared to dry care, assessment of selected components of breast milk collected on the third day after delivery, taking into account the content of nutrients, IL-1, IL-6 and erythropoietin. And also assessment of the possibility of obtaining, isolating, and in vitro culture of progenitor and stem cells derived from human milk.

Material and methods: The study was divided into stages. In the first stage, a questionnaire survey was conducted among pregnant women from two childbirth schools in Warsaw. 556 questionnaires were analyzed. In stage II, a prospective observational study was conducted on a group of 155 healthy full-term infants. Children were assigned to one of the following

groups: using HBM or control. The UCST and accompanying symptoms were assessed. In stage III, selected nutrients of human milk as well as the content of IL-1, IL-6 and EPO were assessed human milk collected from patients from the study group was cultured. Milk samples were obtained from healthy women on the 3rd day after natural childbirth. Separation of adherent cells from human milk was performed independently. Cells were grown in vitro and characterized at the molecular level.. Significance threshold $\alpha = 0.05$.

Results: Stage I: The average age of the surveyed women was 30 years (min-max: 20-42). Most women came from a city with > 100,000. inhabitants (60.43%), 81.47% of all respondents had higher non-medical education. 95.5% of all respondents were primiparous mothers. 27.88% of respondents knew that breast milk can be used in non-nutritional way. Statistically, such knowledge was more common among women who already had children ($p = 0.002$). 52.7% of all respondents considered the use of milk on the umbilical stump as safe, 46.00% as hygienic and 13.7% as effective. 90.5% of all respondents believed that more information should be provided in the media about ecological motherhood supported by scientific facts, of which statistically significantly the most positive answers were among people with non-medical higher education ($p = 0.006$), 89.6% believed that in childbirth schools, during patronage visits, more attention should be paid to natural care supported by scientific facts. 39.9% of respondents wanted to take care the umbilical cord of their own milk, of which statistically significantly more often such declarations were made by people with higher non-medical education ($p = 0.006$). The willingness to start using the breast milk to umbilical cord stump care was more often declared by women who believed that more space in the media should be devoted to the subject of ecological motherhood based on scientific facts ($p < 0.001$), and by woman who wanted that more attention should be paid in birth schools and during patronage visits to the subject of natural care supported by scientific facts ($p < 0.001$), and by consumers of food and ecological cosmetics ($p < 0.001$). The main determinants influencing the consumption of ecological goods were education ($p = 0.010$) and income ($p = 0.035$).

Stage II: The mean body weight of the newborn in the study was 3,461.71 grams ($SD \pm 403.73$). The total separation time in the HBM group was: 198.85 $SD \pm 64.14$ [h], in the control group 249.41 $SD \pm 131.19$ [h] ($p = 0.065$). The use of HBM in the group of children born vaginally was shorter (186.07 $SD \pm 53.45$ h) than for dry-conditioned (207.95 $SD \pm 92.87$ h) ($p = 0.022$).

Stage III: The average content of substances in milk were: fat (3.15 $SD \pm 1.36$ g / 100ml); total protein (2.00 $SD \pm 0.21$ g / 100ml); carbohydrates (7.55 $SD \pm 0.32$ g / 100ml); dry weight (12.86 $SD \pm 1.47$ g / 100ml); average energy (68.07 $SD \pm 13.04$ kcal / 100ml); nutritional protein

(1.58SD \pm 0.19g / 100ml); IL-1 (7.86SD \pm 9.48pg / mL); IL-6 (42.85SD \pm 75.34 pg / mL); EPO (5.88SD \pm 8.06mIU / mL). There was no significant correlation between the tested parameters and UCST. The main bacterial strain isolated from human milk was *Staphylococcus epidermidis*. It was present in 8 samples (66.67% of all samples). The next strains were *Streptococcus mitis*, present in 2 samples of milk (16.67%) and *Staphylococcus aureus*, present in two samples (16.67%). Several types of cells were obtained in *in vitro* culture. Stem cells identified in milk showed expression pluripotency genes: OCT4, SOX2, NANOG, unlike control cells.

Conclusions: A significant percentage of the surveyed group of pregnant women in Poland is interested in the non-nutritional possibilities of using breast milk. The level of education of the surveyed women significantly influenced their willingness to take care of their child's umbilical cord stump with their own milk. The use of breast milk in the care of the umbilical cord stump slightly shortened the UCST. The use of breast milk in the care of the umbilical cord stump significantly shortened the separation time of the stump in the group of children born vaginally. Type of labor significantly influenced the healing time of the umbilical stump. The use of breast milk was not associated with an increased risk of navel infection. IL-1, IL-6 and EPO were isolated from human milk, but there was no correlation between the content of IL-1, IL-6 and EPO in breast milk and the separation time of the umbilical cord stump. Stem cells identified in milk expressed the pluripotency genes: OCT4, SOX2, NANOG, in contrast to control cells. The breast milk collected from women contained only Gram positive bacteria, mainly *Staphylococcus epidermidis*.